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ABSTRACT

The underlying semantic structure of the complete lexicon of four Hebrew-speaking infants at the one-word stage of lexical development was examined. Particular attention was given to the timing of word acquisition and the patterns of identified relationships among words. Three types of interrelationships among early words were explored: (1) relations between equivalent members of the same category; (2) relations between contrast and synonymity; and (3) relations between superordinate-subordinate terms. Data were recorded in diary form by infants' mothers. In an end-state analysis, the complete lexicon of each child during the last week of study was partitioned into semantic fields of adult language. Subsequently, in a developmental analysis, the course of generation of each semantic class was traced and changes over time in the underlying structure of each category were evaluated. Findings suggested that the one-word stage is divided into two developmental phases. During an initial phase mainly unrelated words are learned. Lexical acquisition is characterized by a horizontal covering of as many categories as possible, each containing only a few members. In the second phase, an abrupt change in the rate of learning new words is evident. This phase is characterized by a vertical differentiation within existing categories and by much faster and more efficient acquisition. During the second phase, the child lexicalizes much finer distinctions than before. (RH)

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SIMILARITY, SPECIFICITY AND CONTRAST: A STUDY OF EARLY SEMANTIC CATEGORIES*

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From various sources, including anecdotal descriptions by parents, calculations of the different words in periodical audio-recordings, and detailed case-studies of early lexical development, a number of quantitative characteristics of the one-word stage emerge. Children start to utter early words around their first birthday and subsequently they produce "one-word at a time" for an extended period of 8 to 12 months. Complete lexicons of single words contain between 250 to 350 different entries of adult input language, and the rate at which these words are learned is not steady throughout the stage. Initially new words are added slowly, and during the second half of the stage an abrupt change in the rate of vocabulary growth is noted (e.g. Anisfeld, 1984; Bloom, 1973; Corrigan, 1976; Dromi, in press; McShane, 1980).

Since early lexical acquisition is so extended in time, yielding impressively large vocabularies, it becomes necessary to examine the contents and the underlying semantic structure of such vocabularies. This examination may reveal which contents are picked up by the young child to be lexicalized, to what extent early vocabularies are compareable, and whether young children at the one-word stage do treat related words as belonging to the same semantic categories. The study of lexical diversity is not simple since it involves a longitudinal evaluation of a complex developmental process which entails constant reorganization. Very often a newly acquired word is linked to already existing words in the child's lexicon, which themselves may then undergo semantic redefinition as a result.

In the present study we examined the semantic underlying structure of four complete one-word stage lexicons of Hebrew speaking subjects. We focused

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on the description of how early words are learned in terms of both the timing of their acquisition, and the patterns of identified relationships among them. We tested whether lexical acquisition is characterized by the addition of classses of semantically related words, or by the accumulation of unrelated words which only later become organized as semantic classes. The following three types of interrelationships among early words were tested:

a) Relations between equivalent members of the same category (e.g., a teaspoon, a cup and a knife);

b) Relations of contrast and synonymity (e.g., come - go, nice - kind); and

c) Relations of superordinate-subordinate terms (e.g., food - soup, rice, meat).

The data and analyses

Our data-base consisted of four diary records in which mothers documented the lexical development of their own children.[1] The four records included information about new words as well as descriptions of repeated applications of old words in various non-linguistic contexts. The subjects were from upper-middle class families of native Hebrew speakers, three girls and one boy. The girls were first-born children and the boy a seond child. In comparison the three girls, M, K, and Y, started to talk quite early at the ages of 8(16),[2] 10(12) and 10(16), respectively. The boy G uttered his first words relatively late, when he was 16(0). His record was the smallest and it included only 106 different Hebrew words.[3]

Table 1: The four lexicons of Hebrew speaking one-word stage subjects

Subject	Size of lexicon	N. of analysed words*
M	270	264
K	337	298
Y	338	320
G	106	102

*Personal names were excluded from the present analysis.

1 Two diarists were the authors of this paper, the other two mothers were trained by the first author. We thank the mothers of Y and G for collecting the data.

2 8(16) is to be read 8 month and 16 days.

3 G's record is included in the present study despite its non-typical characteristics. As will be shown, the record was quite detailed and therefore analysis could be performed on it. In the present paper we will not refer to the unique characteristics of this record, and neither will we try to explain it.

In examining the lexicons we made a clear distinction between two levels of analysis. At the first level we examined the complete lexicon of each child during the last week of study and grouped the words into semantic classes that corresponded to semantic fields of adult language. This kind of analysis took into consideration each word only once and was based on the adult's frame of reference. We termed this procedure: the end-state analysis. The second level of analysis was developmental. Here we followed the course of generation of each semantic class and also evaluated changes over time that were noted in the underlying structure of each category. Words were classified as semantically related, at this level of analysis, only if we could identify evidence of relationships in their actual applications in repeated uses. The following set of indicative criteria were used in order to indentify relationships among early words: overextension; misuses of labels and interchangeable labeling; acquisition of superordinate terms; proximity in the time of learning semantically related terms; and concomitant expression of two terms when it was clear that one word is uttered to anchor the meaning of the other (e.g. giddiup-horse, food-bread).[4]

Results

The end-state analysis revealed that the vocabularies of our one-word stage subjects consisted of over 20 different categories of semantically related terms. This figure is significantly larger than we had anticipated on the basis of earlier reports (e.g. Nelson, 1973; Rescorla, 1981). Even G, whose lexicon was far more restricted than the others, acquired 22 different classes of words during the one-word stage. Table 2 shows that the four subjects acquired words of very similar semantic contents. The between-subject variability was very small. All the children acquired at least some representatives of the overwhelming majority of categories during the first half of the one word stage. M acquired 92% of her categories during the first half of the stage, Y and G exhibited a similar pattern and acquired 88% and 95% of their categories that early, and in the case of K, 73% of her categories were represented during the first half of the stage which lasted 16 weeks.

Both synonyms and antonyms were identified in the end-state analysis. The number of antonyms (i.e. M=29, K=17, Y=14, and G=10) greatly exceeded the number of synonyms (i.e. M=8, K=5, Y=3, and G=2). Most antonymic pairs

4 Explicit operative definitions of the above criteria appear in Fishelzon 1985.

TABLE 2 - The categories of the end-state analysis and the timing of their emergence *

Categories	Subjects			
	M	K	Y	G
Animals	F	F	F	F
Body Parts	F	F	F	F
Clothes & Personal Accessories	F	F	F	F
Kinship Terms	F	F	F	F
Food & Drinks	F	F	F	F
Toys	F	F	F	F
Vehicles	F	F	F	F
Kitchen Utensils	F	S	F	S
Furniture & Household Accessories	F	S	F	F
Bowel Movement	-	F	F	F
Qualities	F	F	F	F
Sounds	F	S	F	F
Motion & Movement	F	F	F	F
Kinds of Illness	F	F	F	F
Interpersonal & Social Terms	F	F	F	F
Questions	S	F	S	F
Location & Direction	F	F	F	F
Positions of Body	F	S	F	F
Quantities	F	F	F	F
Actions & Manipulation of Objects	F	F	F	F
Weather	S	S	S	-
Vegetation	F	S	F	F
Self & Others (pronouns)**	S	S	S	F
Shapes	F	F	-	-
States & Sensations	F	S	-	-
Temporal Terms	F	S	S	-
Total N of Categories	25	26	24	22

* Each category consists of at least three different lexical items. The recording of the first word in each category is taken as evidence of its emergence. Timing was calculated separately for each subject; F = the first half of the one word stage, S = the second half of the one word stage.
** Personal names were excluded from this analysis.

encoded graded relations (e.g., cold - hot), and only a few were of the converse kind (e.g., give - take). Converse pairs were problematic for all children who displayed confusion in their early applications. Thus, all subjects said 'take' when they intended 'give me', and two subjects (K and Y) initially said 'come, come to me' when they wished to be picked up by an adult, or when they wanted to go outside. Extremely few superordinate terms were identified in the four lexicons.

Only Y and M acquired the general terms for toys and clothes. All subjects acquired the term 'food', but used it as a superordinate term only towards the very end of the one-word stage. All uses of the superordinate terms were correct or adult-like in the very first records.

The developmental analysis yielded a lower number of categories compared to the ones identified before. Clear evidence of acknowledged relationships among words were noted for only 17 different categories in M's and K's lexicons. Y had 14 different recognized categories, and G's record contains clear evidence that he recognized relationships among different words in only seven categories. The developmental analysis confirmed our previous finding that categories are formed early during the one-word stage. All of the subjects had acquired few representatives of almost all classes by the end of the first phase of the stage. Moreover, while during the first half of the stage the addition of related words to an existing category was slow (and sometimes several weeks passed before the child acquired a semantically related term) during the second phase categories were filled-in very quickly.During this later phase the children often learned closely related words during a single week. An illustrative example is K's acquisition of the terms 'undershirt' 'to put on, or dress', 'underpants', 'pants, trousers', 'pantyhose' and 'socks' within three days in the 26th week of study (see more on that in Dromi, in press: Chapters 10, and 12).

There were cases in which we could not identify any sign of recognition of relationships among words that in fact belong to the same adult semantic field. Kinship terms were learned slowly by Y, but she never overextended existing terms to denote related meanings for which she had not yet acquired labels. M's class of kitchen utensils was elaborate. It included the terms 'a bottle', 'a plate', 'a spoon', 'a glass', 'a goblet', and 'a fork'. M never confused these terms and it was clear that she differentiated between the referents and correctly mapped them onto conventional words.

In the attempt to identify underlying processes in the formation of semantic categories we could not isolate a single process which was operative for all the children or even across a single lexicon. A comparison of the four lexicons, however, revealed the following identical strategies which are illustrated below:

a) Selective extension of a term: A single term denotes more than a single referent, but the scope of extension is limited to only a subset of adult category.

K: pipi 'urine'; Used for the top part of a nakeed body, the stomach, breast, and belly button and never used for a hand, a leg or parts of the face.

M: dag 'fish'; Used for turtle and fish and never extended to other animals.

b) Original groupings: The child extends a term beyond the limits of a given semantic field or a given grammatical class.

G: tas 'to fly'; Used for airplanes, birds, the moon and the action of flying.

M: xam 'hot'; Extended to hot foods and drinks, to the tap and water in the bath, to different clothes, and also to the action of undressing and taking off a necklace which was too tight.

c) Subdivision of a class: The child encodes verbally contrasts which are not lexicalized in adult language.

M: kos 'a glass'; Used for drinking glasses, mugs, and bottles.

totn 'to drink'; Used for her own drinking glass, her bottle, and the action of drinking.

K: lala; A request to hear music on the radio, or to watch a TV show. Also said while playing with the buttons of a washing machine.

šir 'a song'; A request that mother sing a song.

Y: ha 'hot'; Used for liquid foods which are eaten from a soup plate.

bis 'a bite'; Used for food items which the child could bite e.g. bread, wafers, snacks.

d) Evidence of reorganization within a semantic class: The addition of a new word to an existing category causes confusion and "late errors" emerge.

M: ein 'no more'; Used in correct contexts until the word yes 'there is' was acquired. When having both terms the child misused them both, and uttered ein to refer to existence and non-existence as well.

K: tets 'to go out'; Used correctly until its antonym ikanes 'to go in' was acquired. Thereafter ikanes was overextended and used for going in and out as well.

e) Contextual categories: There is evidence of grouping together different objects and actions which can be recognized as constituents of the same situation.

K: hita 'going out'; Used for her own hat, her bottles, mother's purse, plastic bags, her stroller, and said while walking around the house and holding a purse.

Y: gan 'kindergarten'; Used for a playground, children playing outside, a swing, a slide, a kindergarten building, and children in general.

f) A new word as a synonym: A new word is uttered together with an old word which encode similar meaning.

K: dod 'an uncle'; Initially used for both strangers and noises coming from outside, later when bum was acquired for noises the child said dod-bum when she referred to noises.

M: oid 'to take off'; Initially used for taking off and taking out. When totsi 'to take out' was acquired the child said oid-totsi when she referred to taking out.

The similarity observed for all subjects is significant since it indicates that the processes noted above are general and can not be considered idiosyncratic for single subjects. The fact that we could point to such a high similarity among the four diaries proves that subjective detailed descriptions of mothers do not exclude the possibility of carrying out more objective analyses which are also comparative.

Conclusions

The results of both analyses support Dromi's (1986, and in press) ealier claim that the one-word stage is, in fact, divided into two developmental phases. The present study suggests that during the initial phase it is mainly unrelated words that are learned by the child. The lexical acquisition is characterized by a horizontal covering as many categories as possible, each containing only few members. In the second phase an abrupt change in the rate of learning new words is documented (Bloom 1973; Corrigan, 1978; Dromi, in press). This phase is characterized by a vertical differentiation within existing categories that were created during the first phase. The child's linguistic development during the second phase is much faster and more efficient. During the second phase the child lexicalizes much finer distinctions than he did before.

Our findings support Clark's (1983, 1985) recent proposal that very young speakers appreciate the principle of lexical contrast. As we have shown, children proceed from lexicalizing wide contrasts to lexicalizing finer ones. In some cases, children even innovate words for expressing contrasts which are not conventionally encoded in the adult input language. Not all child categories are equivalent to those of adults. Non-conventional groupings are detected in one-word stage vocabularies. We found that in some cases early meanings are related only because words which encode them are learned under similar external conditions of situation, input, and perceptual contiguity. This finding supports recent claims that the initial meaning representations of some words are holistic rather than componential (Barrett, in press; Dromi 1984, in press; Nelson & Lucariello, 1985).

Our findings indicate that several early words encode repeated situations which reoccur regularly, and that not all experiences are encoded or conceptualized in the same manner by the learner. In the course of building up a productive lexicon several processes of category formation are followed simultaneously by the young child.

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